

# Participatory Budgeting

Given any suggested alternate budget  $\mathbf{x}$  (e.g. the budget of the first voter), define sets

$A_j$  = set of all voters who want at least as much money for item  $j$  as  $x_j$

$B_j$  = set of all voters who want strictly more money for item  $j$  than  $x_j$

For any set of voters  $Q$ , let  $\mathbf{p}(Q)$  represent the total weight of the voters in  $Q$ . The test now becomes

$\exists ? \mathbf{p} \in S(\alpha, \beta)$  and  $t \in \mathbb{R}$  such that

$\forall j: p(A_j) \geq t \geq p(B_j)$

$N$  voters,  $M$  items  $\Rightarrow 2M+2N+1$  constraints,  $N+1$  variables